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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/653,186

09/03/2003

Masahiko Hasunuma

04329.3133

1732

7590

12/06/2004

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EXAMINER

KANG, DONGHEE

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 12/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/653,186

Applicant(s)

HASUNUMA ET AL.

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 6 and 9-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 7 and 8 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>09/03/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Embodiment Fig.1 (claims 1-5, 7 & 8) in the reply filed on 09-30-04 is acknowledged. The traversal is on the ground(s) that the Figures are interrelated to another and should be prosecuted as part of the same application. This is not found persuasive because 35 U.S.C. 121 quoted in the preceding section states that the Commissioner may require restriction if two or more "independent and distinct" inventions are claimed in one application. In 37 CFR 1.141, the statement is made that two or more "independent and distinct inventions" may not be claimed in one application. If it can be shown that the two or more inventions are in fact independent, applicant should be required to restrict the claims presented to but one of such independent inventions. 35 U.S.C. 121 provides that restriction may be required to one of two or more independent and distinct inventions.

The general principles relating to distinctness or independence may be summarized as follows:

(A) Where inventions are independent (i.e., no disclosed relation therebetween), restriction to one thereof is ordinarily proper, MPEP § 806.04 - § 806.04(i), though a reasonable number of species may be claimed when there is an allowed (novel and unobvious) claim generic thereto. 37 CFR 1.141, MPEP § 809.02 - § 809.02(e).

(B) **Where inventions are related as disclosed but are distinct as claimed, restriction may be proper.** Embodiments 1-10 are related but are distinct

The requirement is still deemed proper and is therefore made FINAL.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed September 03, 2003.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 5, 7 & 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Gates et al. (US 6,617,690).

Re claim 1, Gates et al. teach a semiconductor device comprising (Fig.2):

An insulating film (10a) which is provided in at least one layer above a substrate (8); and whose relative dielectric constant is 3.4 or less (Col.5, lines 1-23); at least one conductive layer (14a) provided in the insulating film; at least one conductive plug (12a, right) which is formed in the insulating film and which is electrically connected to the conductive layer to form a conduction path; at least one insulating (reinforcing) material

(18, SiCN: Col.6, lines 34-38) which is provided under at least the conductive layer; and at least one first reinforcing plug (12a, left) which is connected to the conductive layer and which is formed in contact with the reinforcing material.

Gates et al. do not explicitly teach the claimed term "reinforcing". However, the insulating material 18 would meet the claimed term reinforcing because both are comprise SiCN whose Young's module is 30 Gpa or more.

Re claim 5, Gates et al. teach the insulating films and the reinforcing materials are stacked and arranged in two or more layers, respectively, and the conductive layers, the conductive plugs, and the first reinforcing plugs are provided with respect to the insulating films and the reinforcing material of the respective layers.

Re claim 7, Gates et al. teach a barrier metal film (13a) with which the conductive plug is coated and which contains a high-melting metal.

Re claim 8, Gates et al. teach the insulating film comprising polyimides whose Young's modulus is 7 (see Table 1 in Matsunaga et al. US PAT 6,559,548).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gates et al. (US 6,617,690).

Gates et al. do not explicitly teach an interval between plugs including the first reinforcing plug and the conductive plug is set to 5 μm or less. It is an obvious matter of routine experimentation to find the optimal interval distance ranges. Generally, difference in interval distance will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such interval distance is critical.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the interval distance between plugs, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Allowable Subject Matter

8. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Gates et al. fail to teach a plurality of first reinforcing plugs are arranged within 5 μm from the conductive plug, and an interval between plugs including the respective first reinforcing plugs and the conductive plug is set to 1 μm or less.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Matsunaga et al. (US 6,559,548).

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Donghee Kang, Ph.D.
Primary Examiner
Art Unit 2811

dhk